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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/673,308	09/29/2003	Ralph W. Bennett		3209

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EXAMINER	
YAM, STEPHEN K	
ART UNIT	**PAPER NUMBER**
2878	

DATE MAILED: 06/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/673,308	BENNETT ET AL.
	Examiner	Art Unit
	Stephen Yam	2878

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-5 and 12-16* is/are allowed.

6)☒ Claim(s) *6-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *0903*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 6-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Katou JP09-309402 in view of Hageniers US Patent No. 4,705,395.

Regarding Claims 6-8, Katou teaches (see Fig. 1 and 2) a scanner for determining range to a target object (M) with a rotatable scanning mirror (43a) capable of assuming a neutral position (P4) (see Fig. 1), a maximum positive angular displacement (P6) from said neutral position, a maximum negative angular displacement (P1) from said neutral position, and a plurality of other positions therebetween (P2, P3, P5) (see Paragraph 0024), and wherein said scanning mirror provides a plurality of scanning mirror data values corresponding to said angular displacement of said scanning mirror (see Paragraph 0025-0027), a light beam (out of (42a)) directed toward said scanning mirror and from thence out toward said target object in order to form an impact point on said target object (see Fig. 1 and 2), and a camera (44b) directed toward said scanning mirror so that a field of view of said camera is directed out toward said target object (see Paragraph 0019), so that said laser beam and said field of view of said camera are swept across said target object in synchronization (since both are oriented towards mirror (43a), and wherein said camera provides a plurality of camera data values corresponding to a plurality of locations of said impact point within said field of view of said camera (since the camera is a

PSD (position-sensitive device) which inherently contains multiple light converting elements, each outputting a distinct signal), with one camera data value corresponding to each particular location of said impact point within said field of view of said camera (since the camera is a PSD (*position*-sensitive device)), with a method for converting each of said camera data values to a distance from said scanner to said target object (see Paragraph 0019), a.) comprising selecting a plurality of calibrated angular positions (since measurement devices are calibrated prior to use) (see also Paragraph 0025) for said rotatable scanning mirror in the range between said minimum and maximum angular displacements (P1-P6) (see Fig. 1 and 2), inclusive of said minimum and maximum angular displacements. Katou also teaches successfully determining a distance from the scanner to the target (see Paragraph 0021-0022). Katou does not teach utilizing a laser beam for light, or for each of said plurality of calibrated angular positions providing a polynomial equation which accurately solves for said distance from said scanner to said target object, with entering a specific camera data value into one of said polynomials, wherein said one of said polynomials corresponds to the calibrated angular position which is nearest to said angular displacement of said scanning mirror in order to determine a distance from said scanner to said target. Regarding Claims 7-8, Katou does not teach the polynomial equations as third or fourth order polynomial equations. Hageniers teaches (see Fig. 1) a similar scanner for determining range to a target object (25), with a laser beam (see Col. See Col. 1, lines 48-53) directed towards the target object, with providing a polynomial equation (see Col. 3, line 41 to Col. 4, lines 9) which accurately solves for said distance from said scanner to said target object (see Col. 3, lines 31-40) for an angular position of the laser light source, with entering a specific camera data value into the polynomial (see Col. 3, line 52 to Col. 4, line 2), wherein said polynomial corresponds to

the angular displacement of the light source in order to determine a distance from said scanner to said target (see Col. 3, lines 31-40), with the polynomial equations as third or fourth order polynomial equations (see Col. 4, lines 3-9). Inherently, by the principles of trigonometry, differing light beam angles would require different polynomial coefficients to accurately calculate the distance from the scanner to the target, and since the angles of the mirror in the device of Katou are *predetermined* (see Paragraph 0025 and 0028), a separate calculation is performed for each of the six angles according to the principles of trigonometry, with each calculation "*nearest* to said angular displacement of the scanning mirror" actually *corresponding* to the angular displacement of the scanning mirror. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a laser beam as a light source and provide a polynomial equation for each angular position which accurately solves for the distance from the scanner to the target object and entering a camera data value into the polynomial to determine a distance form the scanner to the target, as taught by Hageniers, in the method of Katou, to provide collimated light for increased light intensity and contrast for improved detection, and to provide efficient and accurate calculation of distance.

Regarding Claims 9-11, Katou in view of Hageniers teach the method in Claims 6-8, according to the appropriate paragraph above. Katou does not teach using first and second polynomials corresponding to calibrated angular positions proximate to but, less than said angular displacement of the scanning mirror and greater than said angular displacement of the scanner mirror, respectively, to determine a first and second calculated distance, respectively, and interpolating between the first and second calculated distances to obtain an interpolated calculated distance. It is well known in the art to utilize interpolation between two different

values calculated separately to provide an interpolated result, when discrete measurements are utilized. It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide first and second polynomials corresponding to calibrated angular positions proximate to but, less than said angular displacement of the scanning mirror and greater than said angular displacement of the scanner mirror, respectively, to determine a first and second calculated distance, respectively, and interpolating between the first and second calculated distances to obtain an interpolated calculated distance, in the method of Katou in view of Hageniers, to measure increased points on the object for distances, to enable a sharper and more well-defined profile to reduce object detection errors.

Allowable Subject Matter

3. Claims 1-5 and 12-16 are allowed over the prior art of record.

4. The following is a statement of reasons for the indication of allowable subject matter:

The invention as claimed, specifically in combination with providing an error correction matrix, including a plurality of calibrated angular positions for said rotatable scanning mirror in the range between said minimum and maximum angular displacements, inclusive of said minimum and maximum angular displacements, a plurality of calibrated linear positions for said scanner in the range between said minimum range and said maximum range, for each of said plurality of calibrated angular positions and said calibrated linear positions, an error correction value, and comparing said initial calculated value against said error correction matrix, using the nearest of said calibrated linear positions in said matrix to said initial calculated distance and the

nearest of said calibrated angular positions in said matrix to said angular displacement of said scanning mirror, in order to determine an appropriate error correction value; and e. adding said appropriate error correction value to said initial calculated distance in order to determine a corrected calculated distance, is not disclosed or made obvious by the prior art of record.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Hecker et al. US Patent No. 4,775,235 teaches a 3-D scanning system using triangulation, with a mirror deflecting incident and reflected light beams.

Leu et al. US Patent No. 5,113,080, teaches a distance measuring device using polynomials to determine a distance to a target.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen Yam whose telephone number is (571)272-2449. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (571)272-2444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SY

THANH X. LUU
PATENT EXAMINER